

## Part II

# General Description of the BTeV Detector

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# Chapter 2

## Description

In our original June 2000 proposal, the detector covered the angular region from 10 mr to 300 mr relative to the proton beam and from 10 mr to 300 mr relative to the anti-proton beam. We referred to each region of angular coverage as an “arm” of the spectrometer and described this as a “two arm” detector. Here we define a descoped version of the detector, which covers only one of these two angular regions, the forward anti-proton region, and is, therefore, a “single arm” detector. A schematic of the “single-arm” detector is shown in Fig. 2.1. The new design is capable of carrying out the full program of measurements albeit on a longer time scale. The new design also permits the installation of components on the “uninstrumented side” later on.

The key design features of BTeV include:

- A dipole located on the IR, which permits BTeV to have an effective “two arm” acceptance. However, in the current plan, only one arm is instrumented.
- A precision vertex detector based on planar pixel arrays;
- A detached vertex trigger at Level 1 which makes BTeV efficient for most final states, including purely hadronic modes;
- Precision tracking using straw tubes and silicon microstrip detectors, which provide excellent momentum and mass resolution out to 300 mr;
- Excellent particle identification using a Ring Imaging Cherenkov Detector (RICH). The RICH provides hadron identification from 3-70 GeV and lepton identification from 3-20 GeV, out to the full aperture of 300 mr, which is crucial since the muon detector and calorimeter do not cover the full solid angle.
- A high quality  $\text{PbWO}_4$  electromagnetic calorimeter, covering 200 mr, capable of reconstructing final states with single photons,  $\pi^0$ 's,  $\eta$ 's or  $\eta'$ 's, and identifying electrons;
- Excellent identification of muons out to 200 mr using a dedicated detector consisting of a steel toroid instrumented with proportional tubes. This system has the ability to supply a dimuon trigger; and

# BTeV Detector Layout

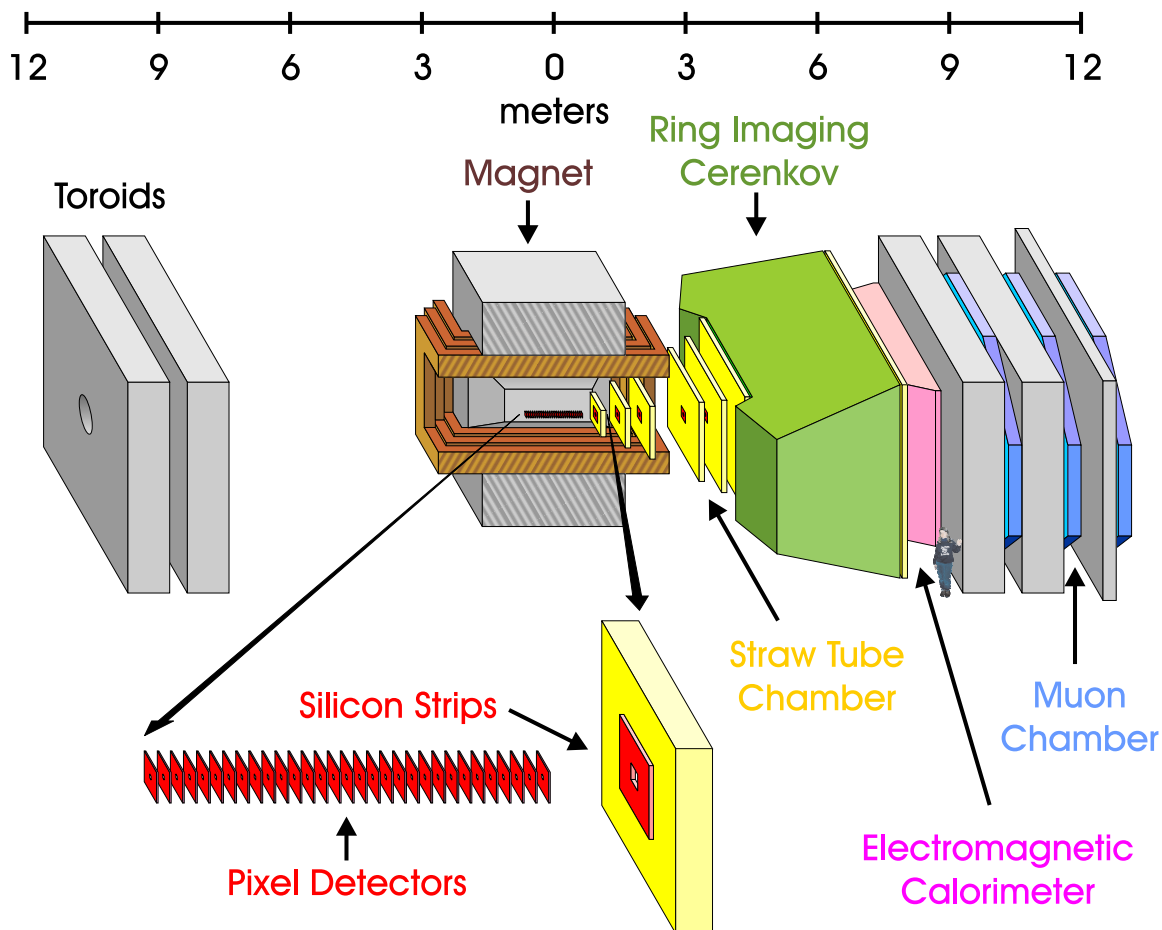


Figure 2.1: Layout of the rescoped BTeV Detector (only one arm instrumented)

- A very high speed and high throughput data acquisition system which eliminates the need to tune the experiment to specific final states.

A detailed description of each part of the detector is given in the next part of this report. The level of detail is sufficient to provide the reader with a good overview of the experimental apparatus and a reasonable understanding of the solution to all the various problems associated with carrying out our ambitious program of studying  $B$  decays. We try to present present enough detail which an expert might need to understand the implementation and status of development of each detector technology and to evaluate our cost estimate and schedule. However, we do not provide complete engineering drawings for every component, nor do we discuss the many calculations that went into the optimization of the design. Additional information may be found in the many writeups and reports, which are referenced in the text. The physics case for BTeV is presented in the BTeV Conceptual Design Report [1].

# Bibliography

[1] BTeV Document 2058:

<http://www-btev.fnal.gov/cgi-bin/DocDB/ShowDocument/docid=2058>